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Mass Screening for Retrocochlear Disorders

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In their article, "Mass Screening for Retrocochlear Disorders: Low-Field (0.2-Tesla) versus High-Field (1.5-T) MR Imaging," Dr Dubrulle and his associates ask whether low-field-strength open T1-weighted spin-echo contrast-enhanced MR images of the cerebellopontine angle (CPA) and internal auditory canal (IAC) can be used to effectively diagnose lesions that cause sensorineural hearing loss (SNHL). A comparison of this technique against the criterion standard of high-field-strength contrast-enhanced T1-weighted MR imaging was made. The authors concluded that 0.2-T contrast-enhanced T1-weighted imaging is "very reliable in detecting vestibular schwannomas and, more generally, retrocochlear disorders."

We assume that the authors were asking this question to give the referring physician a second option when a patient with isolated unilateral SNHL is either too large or too claustrophobic to tolerate imaging in a high-field-strength MR machine. From this data, we can safely say that a patient with unilateral SNHL who is undergoing imaging investigation for only acoustic schwannoma of the CPA-IAC can be effectively imaged with a low-field-strength open MR system if an enhanced T1-weighted sequence is used.

Having concluded that the low-field-strength MR technique is reliable, the authors qualify this statement by pointing out the weaknesses of this technique. First, they state that if an intracanalicular acoustic schwannoma is present on low-field-strength MR images, it is not possible to be sure of its relationship to the cochlear aperture. Consequently, they recommend that all patients in whom tumor is discovered in the IAC should also undergo high-field-strength enhanced MR imaging. Next, they assert that the low-field-strength technique did not depict the non-tumorous lesions and that all of these had complex symptoms. As a result of these two observations, the authors concluded that patients with a high likelihood of acoustic schwannoma based on standard otologic test results and patients with complex symptoms should not be referred for low-field-strength imaging. Consistent and effective triaging of these two subgroups in the clinical arena seems likely to be unsuccessful, at least in the average imaging center setting.

Because all previous articles regarding screening techniques for unilateral SNHL refer to the use of thin-section (1–3 mm), 2D or 3D T2-weighted MR imaging, the reference to "mass screening" in the title of this article is somewhat confusing. Low-field-strength MR imaging, which includes whole-brain imaging and contrast-enhanced T1-weighted axial and coronal imaging of the CPA-IAC, should probably not be referred to as screening. Instead, it should be thought of as a possible alternative when a patient cannot undergo high-field-strength MR imaging. In this context, the term screening is best reserved for an alter-

native imaging approach that achieves results similar to those of high-field-strength MR imaging but requires less time and no administration of contrast material. Such a screening MR technique could be substantially less expensive because the costs associated with contrast material and increased time within the MR unit are avoided.

The criterion-standard imaging test for the diagnosis of lesions of the CPA-IAC is contrast-enhanced high-field-strength MR imaging. This test has been shown to have high sensitivity and specificity in the diagnosis of acoustic schwannoma. However, because of the need for MR contrast enhancement, the cost of this examination may result in its postponement. Instead, multiple rounds of audiometric, impedance, and brain stem evoked-response testing may occur over months to years, with the final yield of positive contrast-enhanced MR imaging still remaining less than 10% in most imaging centers. Although MR imaging is a highly reliable test, false-positive contrast-enhanced MR results of acoustic schwannomas continue to be reported in the literature (1–3).

A search for a fast and effective screening MR imaging protocol for use earlier in the clinical evaluation of a patient with unilateral SNHL has led to multiple publications on this subject (4–8). A variety of high-resolution T2-weighted MR sequences have been used, with the common goal of creating thin-section MR images that show the four cranial nerves in the IAC as low-signal-intensity linear structures bathed in high-signal-intensity CSF. Acoustic schwannoma, or any other space-occupying lesion, is then seen on these images as a low-signal-intensity mass surrounded by the high-signal-intensity CSF.

Continued debate about what lesions may be missed with this high-field-strength MR screening technique has been quieted, in part, by reports showing that a variety of other diagnoses may be made on the basis of screening MR imaging (7, 8). An attempt at achieving a diagnostic screening study with low-field-strength (0.35-T) MR imaging resulted in encouraging findings with thin-section (1-mm) images (9). Careful quality control of any such screening program is essential to its continued success. If individual cranial nerves in the CPA-IAC are clearly visible within the high-signal-intensity CSF, no matter what the technical parameters, the study will depict the mass lesions present in the area.

In conclusion, high-field-strength contrast-enhanced MR imaging of the CPA-IAC remains the first-line imaging method in patients with isolated unilateral SNHL. Supplanting this technique with high-field-strength, thin-section, screening T2-weighted MR imaging is possible if careful quality control is used. Such a screening protocol can be cheaper because of the decreased time with the MR unit and the avoidance of the

cost of contrast material. If a patient is referred for imaging with a low-field-strength magnet as a result of obesity or claustrophobia, maximizing the T1-weighted contrast-enhanced MR sequence in the CPA-IAC area will permit the diagnosis of mass lesions, including acoustic schwannomas. If a lesion is found on low-field-strength MR contrast-enhanced images, the question of fundal cap size and cochlear aperture penetration can be answered either with high-field-strength contrast-enhanced MR imaging or high-field-strength T2-weighted screening MR imaging.

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